

PATENT ABSTRACTS OF JAPAN

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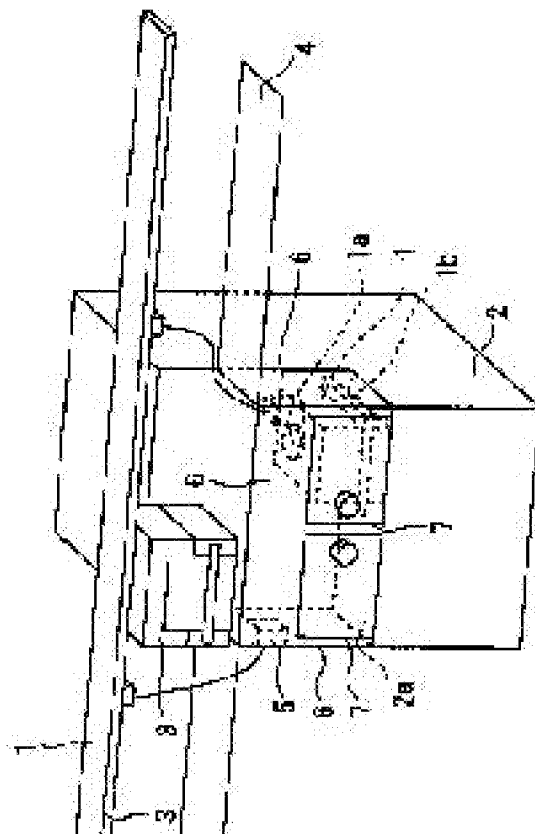
(21)Application number :	2001-066041	(71) Applicant :	SEMICONDUCTOR LEADING EDGE TECHNOLOGIES INC
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(54) **SUBSTRATE-PROCESSING APPARATUS, SUBSTRATE-PROCESSING SYSTEM, AND SUBSTRATE TRANSFER METHOD**

(57)Abstract:

PROBLEM TO BE SOLVED: To minimize damages to peripheral members even when a wafer carrier falls down during movement or lifting/lowering operations of the wafer carrier on a substrate-processing apparatus.

SOLUTION: A substrate-processing apparatus for performing prescribed processing operation over a wafer transferred from a load port door includes a load port base 2a for mounting thereon a wafer carrier, accommodating a plurality of wafers in front of the load port door and a shielding plate provided, so as to surround the periphery of the load port base 2a.





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CLAIMS

[Claim(s)]

[Claim 1]It is a substrate processing device which performs predetermined processing to a substrate carried in from a load port door, A substrate processing device, wherein a shield is formed so that it may have a load port pedestal in which a substrate storage jig which stored said two or more substrates in a front face of said load port door is laid and the circumference of said load port pedestal may be surrounded.

[Claim 2]Said substrate storage jig is taken in and out to said load port pedestal by a transportation means, The substrate processing device according to claim 1, wherein said transportation means takes said substrate storage jig in and out to said load port pedestal by making it go up and down said substrate storage jig in a field surrounded by said shield.

[Claim 3]It has a locking mechanism held where a door which can be opened and closed, and which was provided in said shield, and said door are closed, The substrate processing device according to claim 2 holding where it operated said locking mechanism and said door is closed, when taking said substrate storage jig in and out to said load port pedestal by said transportation means.

[Claim 4]The substrate processing device according to claim 3 holding where said door is closed, when said substrate storage jig conveyed from other processing units arrived above said load port pedestal.

[Claim 5]Are the substrate processing system by which two or more substrate processing devices which perform predetermined processing were connected to a substrate carried in from a load port door via a transportation means, and said substrate processing device, It has a load port pedestal in which a substrate storage jig which stored said two or more substrates in a front face of said load port door is laid, A substrate processing system holding where said door of the substrate processing device concerned is closed, when said substrate processing device which is provided with a shield formed so that the circumference of said load port pedestal might be surrounded, and with which said substrate storage jig is conveyed was specified.

[Claim 6]Are the substrate processing system by which two or more substrate processing devices which perform predetermined processing were connected to a substrate carried in from a load port door via a transportation means, and said substrate processing device, It has a load port pedestal in which a substrate storage jig which stored said two or more substrates

in a front face of said load port door is laid, It has a shield formed so that the circumference of said load port pedestal might be surrounded, A substrate processing system holding where said door of the substrate processing device concerned is closed, when it arrived above said load port pedestal of said substrate processing device with said specific substrate storage jig conveyed by said transportation means.

[Claim 7]Two or more substrate processing devices which have the load port pedestal which had the circumference surrounded are connected via a transportation means with a shield provided with a door which can be opened and closed, It is a substrate conveying method using a substrate processing system makes it go up and down a substrate storage jig which stored two or more substrates by said transportation means, and took said substrate storage jig in and out of which to said load port pedestal of each substrate processing device, A substrate conveying method holding where said door is closed when taking said substrate storage jig in and out to said load port pedestal using said transportation means.

[Claim 8]The substrate conveying method according to claim 7 holding where said door of the substrate processing device concerned is closed, when said substrate processing device with which said substrate storage jig is conveyed was specified.

[Claim 9]The substrate conveying method according to claim 7 holding where said door of the substrate processing device concerned is closed, when it arrived above said load port pedestal of said substrate processing device with said specific substrate storage jig conveyed by said transportation means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the substrate processing device, substrate processing system, and substrate conveying method which use a substrate combining the wafer carrier stored and carried.

[0002]

[Description of the Prior Art]It is common to use a wafer carrier (substrate storage jig) from a viewpoint of the convenience of storage and conveyance of a semiconductor substrate in the semiconductor manufacturing process in recently.

[0003]For example, in storage and conveyance of the 300-mm wafer in diameter which is becoming in use, FOUP (FrontOpening Unified Pod) generally specified by the SEMI standard as a wafer carrier is used. Information, including the detailed size of FOUP, etc., is indicated in the SEMI standard E57, E1.9, and E47.1 grade.

[0004]Drawing 2 is a schematic diagram for explaining the automatically carry method of the wafer carrier (FOUP1) in the production site in which two or more substrate processing devices 2 were installed.

The automatic transferring machine of FOUP1 by OHT(overhead hoist transfer, Overhead Hoist Transfer)3 is shown.

[0005]In a chip fabrication factory, the wafer which receives various processing moves between each substrate processing device 2, after having been stored by FOUP1. Since FOUP1 which stored two or more wafers of the diameter class of 300 mm is the weight of not less than 8 kg, it will be hard to consider transportation by a safe saint hand, and it will use the automatic conveyor machine of OHT3 grade.

[0006]OHT3 is a typical automatic conveyor machine of FOUP1 in the bay of a chip fabrication factory. The load port pedestal 2a is formed in each of two or more substrate processing devices 2 installed successively, and it is constituted so that FOUP1 conveyed from other substrate processing devices 2 by the hoist mechanism of OHT3 may be laid on the load port pedestal 2a.

[0007]Thus, in the substrate processing system with which each substrate processing device 2 was connected via OHT3, since FOUP1 which stored two or more substrates by OHT3 can be

conveyed between each device, efficient operation of a system can be performed.

[0008]

[Problem(s) to be Solved by the Invention]However, since conveyance of FOUP1 is performed by [as passing along a comparatively high position, for example, the height position about the overhead location of the worker who works in a factory,] from the purpose of avoiding an obstacle, If that FOUP1 falls during conveyance arises, the problem that the substrate in FOUP1 and the member around drop positions are damaged will occur.

[0009]In particular, in conveyance by OHT3, since OHT3 is grasping the top flange (Top Flange) 1a of the FOUP1 upper surface, when the top flange 1a is damaged during conveyance, there is a possibility that FOUP1 may fall.

[0010]When FOUP1 falls, the stored wafer is not only damaged, but there is a possibility that the equipments of the lower part of drop positions may be damaged. Usually, between the substrate processing devices 2, damage to the equipments of FOUP1 and a lower part can be reduced by providing caudad reticulated covering of the rail of OHT3. However, in the position in which the substrate processing device 2 is arranged, since it is necessary to carry in FOUP1 to the substrate processing device 2, reticulated covering cannot be provided. Therefore, the top flange 1a is damaged in the midst of grasping the top flange 1a and having gone up and down in the upper part of the substrate processing device 2, or. When the top flange 1a had separated from the mechanism in which the top flange 1a of OHT3 is held, it was not able to avoid that the surrounding member of FOUP1 and the substrate processing device 2 was damaged. Since especially the drop positions of FOUP1 serve as the load port pedestal 2a for the FOUP1 delivery provided in the substrate processing device 2 in this case, FOUP1 which fell collided and bounced to the load port pedestal 2a, and since it collided with a surrounding member, or dispersed with the shock of fall and collided with a surrounding member, it might do damage to the member, equipments, etc. of these. Improvement in the safety of the worker who is working in the neighborhood of the substrate processing device 2 needed to be considered.

[0011]While OHT3 is performing ascent and descent operation on the load port pedestal 2a, when the worker hand-control-supplies FOUP1 to the substrate processing device 2 and has taken it out to it, FOUP1 supplied by OHT3 and FOUP1 which were supplied by the worker may interfere, and there was a case where trouble was given to a worker's work.

[0012]It is made in order that this invention may solve the above problems, and it is in the 1st purpose suppressing the damage produced in a surrounding member even if it is a case where a substrate storage jig falls, when you make it move and go up and down a substrate storage jig on a substrate processing device to the minimum.

[0013]It is in keeping the 2nd purpose from giving trouble to the work of the worker to whom a wafer carrier performs manual injection and extraction to the substrate processing device concerned, when you make it move and go up and down a wafer carrier on a substrate processing device.

[0014]

[Means for Solving the Problem]A substrate processing device of this invention is a substrate processing device which performs predetermined processing to a substrate carried in from a load port door, It has a load port pedestal in which a substrate storage jig which stored said

two or more substrates in a front face of said load port door is laid, and a shield is formed so that the circumference of said load port pedestal may be surrounded.

[0015]Said substrate storage jig is taken in and out to said load port pedestal by a transportation means, and said transportation means takes said substrate storage jig in and out to said load port pedestal by making it go up and down said substrate storage jig in a field surrounded by said shield.

[0016]When it has a locking mechanism held where a door which can be opened and closed, and which was provided in said shield, and said door are closed and said substrate storage jig is taken in and out to said load port pedestal by said transportation means, it holds, where it operated said locking mechanism and said door is closed.

[0017]When said substrate storage jig conveyed from other processing units arrives above said load port pedestal, it holds, where said door is closed.

[0018]A substrate processing system of this invention is a substrate processing system by which two or more substrate processing devices which perform predetermined processing were connected to a substrate carried in from a load port door via a transportation means, Said substrate processing device has a load port pedestal in which a substrate storage jig which stored said two or more substrates in a front face of said load port door is laid, It has a shield formed so that the circumference of said load port pedestal might be surrounded, and when said substrate processing device with which said substrate storage jig is conveyed is specified, where said door of the substrate processing device concerned is closed, it holds.

[0019]A substrate processing system of this invention is a substrate processing system by which two or more substrate processing devices which perform predetermined processing were connected to a substrate carried in from a load port door via a transportation means, Said substrate processing device has a load port pedestal in which a substrate storage jig which stored said two or more substrates in a front face of said load port door is laid, It has a shield formed so that the circumference of said load port pedestal might be surrounded, and when it arrives above said load port pedestal of said substrate processing device with said specific substrate storage jig conveyed by said transportation means, where said door of the substrate processing device concerned is closed, it holds.

[0020]Two or more substrate processing devices which have the load port pedestal which had the circumference surrounded are connected via a transportation means with a shield provided with a door which can open and close a substrate conveying method of this invention, It is a substrate conveying method using a substrate processing system makes it go up and down a substrate storage jig which stored two or more substrates by said transportation means, and took said substrate storage jig in and out of which to said load port pedestal of each substrate processing device, When taking said substrate storage jig in and out to said load port pedestal using said transportation means, it holds, where said door is closed.

[0021]When said substrate processing device with which said substrate storage jig is conveyed is specified, it holds, where said door of the substrate processing device concerned is closed.

[0022]When it arrives above said load port pedestal of said substrate processing device with said specific substrate storage jig conveyed by said transportation means, it holds, where said door of the substrate processing device concerned is closed.

[0023]

[Embodiment of the Invention]Drawing 1 is a perspective view showing the composition of the substrate processing system concerning this embodiment of the invention. As shown in drawing 1, to the substrate processing device 2 which are devices, such as a semiconductor manufacturing device and a substrate cleaning device. FOUP1 conveyed is made to stop, and in order to open and close the carrier door of FOUP1, and the load port door of the substrate processing device 2 and to take a wafer in and out into the substrate processing device 2, the load port pedestal 2a is formed in the front face. The load port pedestal 2a specified by the above-mentioned SEMI standard is a load port pedestal with a FIMS side. Here, a FIMS side is an abbreviation of a front opening interface mechanical standard (Frountopening Interface Mechanical Standard). The same numerals as drawing 2 are described about the component which is common in drawing 2 in drawing 1.

[0024]OHT3 (transportation means) which conveys FOUP1 is installed above the load port pedestal 2a. As mentioned above, OHT3 is arranged so that between two or more substrate processing devices 2 may be connected. FOUP1 conveyed by OHT3 to the upper part of the load port pedestal 2a is taken down to the load port pedestal 2a, and it is set to a prescribed position by the hoist mechanism of OHT3. And the carrier door of FOUP1 and the load port door of the substrate processing device 2 are opened, and receipts and payments of the wafer into the substrate processing device 2 are performed.

[0025]Directly under OHT3 between the substrate processing devices 2, the 1st safety catch covering 4 that comprised reticulated covering is arranged. The 1st safety catch covering 4 has played the role which prevents the fall to a lower part further, when FOUP1 separates from OHT3 among two or more substrate processing devices 2.

[0026]The 2nd safety catch covering (shield) 6 is formed in the front face and the side of the load port pedestal 2a to directly under [of OHT3] toward the upper part. And the front door 7 is formed in the front face of the 2nd safety catch covering 6. The 2nd safety catch covering 6 arranged on the side of the load port pedestal 2a is connected with the 1st safety catch covering 4 in directly under [of OHT3]. Since the backside of the load port pedestal 2a is a field actually take a wafer in and out of which via a load port door in drawing 1, By arranging the 2nd safety catch covering 6 on the front face and the side of the load port pedestal 2a, the circumference of the load port pedestal 2a can be thoroughly surrounded with the 2nd safety catch covering 6.

[0027]Thus, around the load port where the 1st safety catch covering 4 breaks off. By forming the 2nd safety catch covering 6 that reaches from the load port pedestal 2a to directly under [of OHT3], It can prevent FOUP1 falling to a floor line with the 1st safety catch covering 4, when FOUP1 separates from OHT3 among two or more substrate processing devices 2, When FOUP1 separates from OHT3 in the upper part of the load port pedestal 2a, it can deter that FOUP1 falls to a floor line or FOUP1 disperses with the 2nd safety catch covering 6. Therefore, it can deter that a member, equipments, etc. which have been arranged on the lower region of OHT3 between the substrate processing devices 2 and the outskirts of the substrate processing device 2 are damaged. It also becomes possible to improve the safety to the worker who is working around the substrate processing device 2. By opening and closing the front door 7 provided in the 2nd safety catch covering 6, when taking FOUP1 to the load port

pedestal 2a manually, it can carry out, without using OHT3.

[0028]Next, the taking-out / carrying-in method of FOUP1 interlocked with the opening-and-closing locking mechanism of the front door 7 is explained in detail. Completion of the predetermined processing to the wafer within the substrate processing device 2 will perform a report to that effect from the substrate processing device 2 to the control machinery of a higher rank. The control machinery of a higher rank which received the report sends the carry request of FOUP2 to OHT3. In OHT3 which received the carry request, before going into the carrying out action of FOUP2, it is checked whether the front door 7 of the 2nd safety catch covering 6 is open. If the front door 7 is not open, after holding so that lock the front door 7 and the door lock device 5 may not open it, the carrying out action of FOUP1 is started. If the carrying out action of FOUP1 from the load port pedestal 2a is completed, the lock of the door lock device 5 of the front door 7 will be canceled.

[0029]If OHT3 conveys FOUP1 to the upper part of the load port pedestal 2a of the following substrate processing device 2, it will check that the front door 7 of the 2nd safety catch covering 6 in the substrate processing device 2 of a carrying-in place is not open. And after holding so that lock the front door 7 and the door lock device 5 may not open it before the operation start of OHT3, FOUP1 is dropped toward the load port pedestal 2a of the substrate processing device 2 of a carrying-in place. After taking down FOUP1 on the load port pedestal 2a, the lock of the door lock device 5 of the front door 7 is canceled.

[0030]The linkage with above conveyances of FOUP1 and opening-and-closing locking mechanisms of the front door 7, It can carry out by making the door lock device 5 of the front door 7, and the both sides of OHT3 recognize a mutual interlock signal, and exchanging an interlock signal so that only manual or automatic either may permit transfer operation of FOUP1 to the load port pedestal 2a.

[0031]By this, when taking FOUP1 to the load port pedestal 2a, the front door 7 can be locked, and it becomes possible to protect certainly about FOUP1 conveyed by FOUP1 and OHT3 which were hand-control-supplied by the worker and were taken out interfering.

[0032]Before conveying FOUP1 above the load port pedestal 2a of the following substrate processing device 2, it may be made to lock the front door 7. That is, when the control device of a higher rank specifies the substrate processing device 2 which is the next conveyance time, the manual injection of FOUP1 can be forbidden by locking the front door 7 of the specified substrate processing device 2. Therefore, when performing carrying in of FOUP1 to the substrate processing device 2, and taking out, it can deter certainly that FOUP1 conveyed by OHT3 and FOUP1 by manual injection interfere.

[0033]As explained above, while forming the 1st safety catch covering 4 along with OHT3 according to this embodiment, Since the 2nd safety catch covering 6 was formed so that the circumference of the load port pedestal 2a might be surrounded, Fall of FOUP1 can be prevented beforehand, and while deterring that the member arranged around the lower part of OHT3 or the substrate processing device 2 is damaged, it also becomes possible to raise the safety to a worker. It can deter that FOUP1 under automatically carry and FOUP1 under the manual injection and drawing work by a worker interfere by interlocking the carrying position of FOUP1 and the lock of opening and closing of the 2nd safety catch covering 6 by OHT3.

[0034]When the processing completion of the wafer in the arbitrary substrate processing

devices 2 is reported to higher rank control machinery, By locking the front door 7 of the substrate processing device 2 of the following conveyance point with the door lock device 5, while performing the conveyance directions to the substrate processing device 2 of the following conveyance point to OHT3, control machinery, It can carry out as [supply / by the time non-carried one is conveyed to the following substrate processing device 2, a worker will open the whole surface door 7, and / FOUP1 / another]. Therefore, while avoiding interference with FOUP1 conveyed by OHT3 and FOUP1 which were supplied by the worker, efficient conveyance can be continued, without disturbing the conveying schedule upon which it decided with higher rank control machinery.

[0035]In preparation for breakage of not only the top flange 1a of FOUP1 but the top flange 1a, the side rail 1b may also be grasped simultaneously and OHT3 may convey it. Although a semiconductor substrate 300 mm in diameter was illustrated as an example of the semiconductor substrate inserted in FOUP1 and the processing unit of the diameter board of 300 mm and the processing system were mentioned in this embodiment, it is other, for example, it is also possible to apply this invention to a liquid crystal glass substrate etc.

[0036]

[Effect of the Invention]Since this invention is constituted as explained above, it does an effect as taken below so.

[0037]As the circumference of a load port pedestal is surrounded, even if it is a case where a substrate storage jig separates by having formed the shield in the upper part of a load port pedestal, it can deter a substrate storage jig falling to a floor line, or dispersing.

[0038]It becomes possible to take a substrate storage jig in and out certainly to a load port pedestal by making it go up and down a substrate storage jig in the field surrounded by the shield by the transportation means.

[0039]In taking a substrate storage jig in and out to a load port pedestal using a transportation means, By holding, where it operated the locking mechanism and a door is closed, it can deter that the substrate storage jig conveyed by the transportation means and the substrate storage jig taken in and out with hand control interfere.

[0040]It can deter that the manual injection of the substrate storage jig is carried out in the midst of being supplied on a load port pedestal by holding, where a door is closed, when the substrate storage jig conveyed from other processing units arrives above a load port pedestal.

[0041]It not only throws in a substrate storage jig automatically, but in the state where the locking mechanism is not operated, it can carry out a manual injection if needed by having enabled receipts and payments of a substrate storage jig with hand control via the door.

[0042]When the substrate processing device with which a substrate storage jig is conveyed is specified, by holding, where said door of the substrate processing device concerned is closed, interference with the substrate storage jig by which a manual injection is carried out in a transfer destination can be deterred.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a perspective view showing the substrate processing device concerning the 1 embodiment of this invention.

[Drawing 2]It is a perspective view showing the conventional substrate processing device.

[Description of Notations]

1 FOUP (wafer carrier)

1a Top flange

1b Side rail

2 Substrate processing device

2a Load port pedestal

3 OHT

4 1st safety catch covering

5 Door lock device

6 2nd safety catch covering

7 Front door

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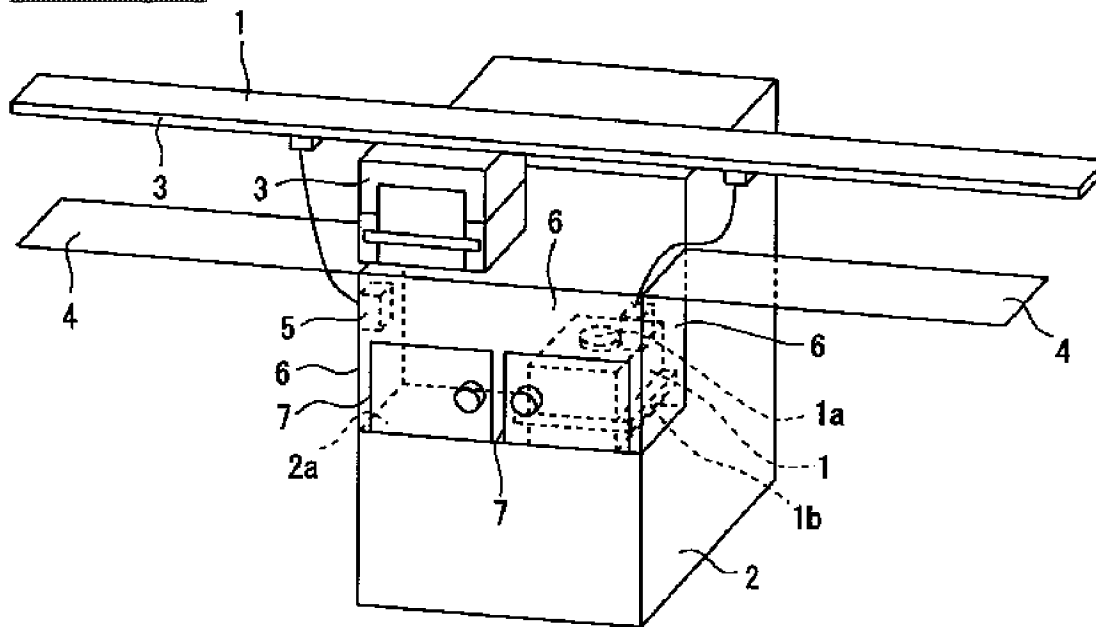
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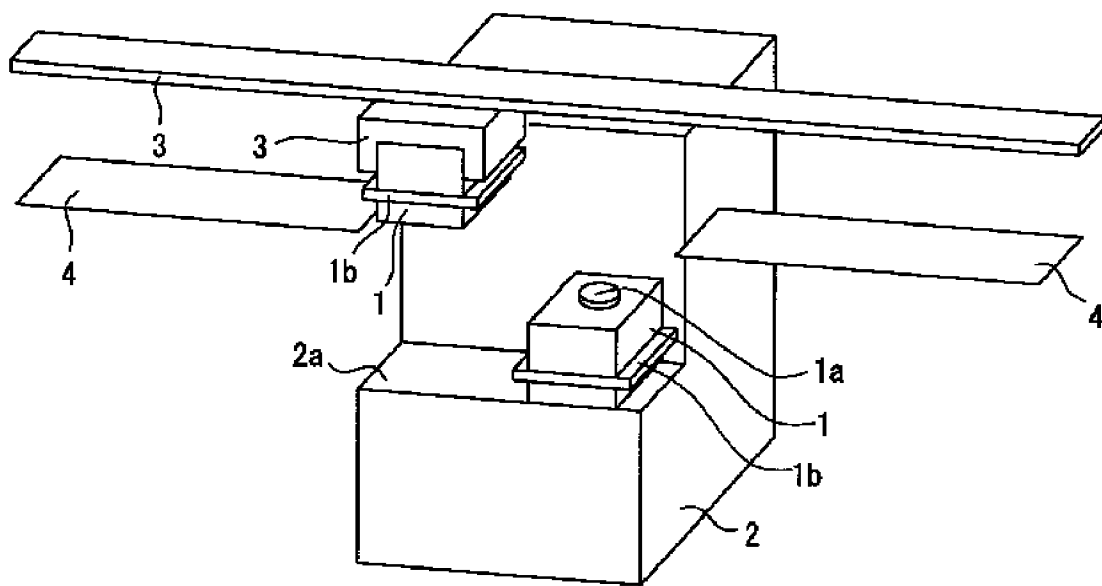
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DRAWINGS

[Drawing 1]



[Drawing 2]



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